



(11)

EP 1 985 671 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
29.10.2008 Bulletin 2008/44

(51) Int Cl.:
C09D 5/00 (2006.01)

(21) Application number: 08251353.2

(22) Date of filing: 08.04.2008

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HR HU IE IS IT LI LT LU LV MC MT NL NO PL PT
RO SE SI SK TR
Designated Extension States:
AL BA MK RS

(72) Inventors:
• Elbon, Leonard Ray
Las Vegas, Nevada 89108 (US)
• Reichwein, David Paul
Elizabeth Town, Pennsylvania 17022 (US)

(30) Priority: 24.04.2007 US 739302

(71) Applicant: The Diller Corporation
Cincinnati OH 45202 (US)

(74) Representative: Cummings, Sean Patrick et al
Keltie
Fleet Place House
2 Fleet Place
London EC4M 7ET (GB)

(54) Solid surface product containing oriented reflective particles and method of making same

(57) A solid surface material which exhibits a pearlescent visual appearance and method of making it are provided. The solid surface material includes a polymer resin, optionally, a filler, and oriented anisotropic pigment particles dispersed substantially throughout the polymer resin to provide the pearlescent visual appearance. The solid surface material is made by forming a mixture of

polymer resin, optional filler, and anisotropic pigment particles; dispersing the pigment particles substantially throughout the mixture; casting the mixture into an open mold; applying a vacuum to the molded mixture to release entrapped gases therein to cause the pigment particles to become oriented in the mixture; and curing the molded mixture to produce the solid surface material.

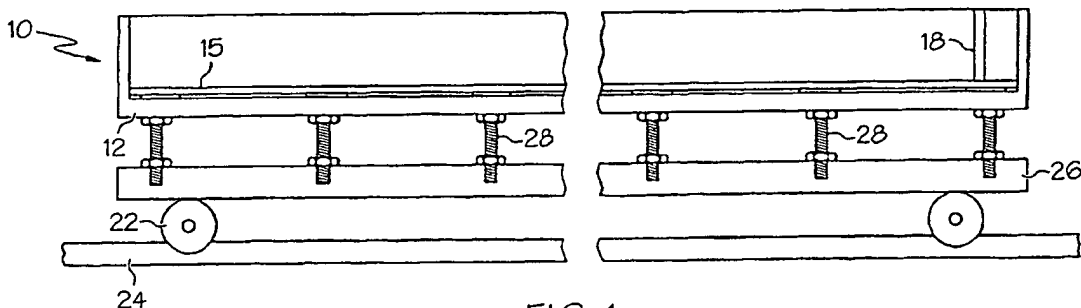


FIG. 1

EP 1 985 671 A1

Description

[0001] The present invention relates to decorative solid surface products formed from filled or unfilled polymer resins, and more particularly to solid surface products containing oriented particles which provide a unique pearlescent visual appearance and to methods of making those products.

[0002] Decorative solid surface products formed from particle filled resins have been long known and are commonly available for use on kitchen and bathroom surfaces. In general, these materials are formed from particle filled resins, the most common resins being polyesters and polyacrylates, with the fillers ranging widely, often used to give particular visual effects to the product.

[0003] Such non-porous, solid surface products are typically commercially available in a wide variety of appearances and colors, with patterns which run throughout the thickness of the products, giving them desirable aesthetics and utility. These materials are also tough and resistant to heat, stains, mildew and impact, and can be easily repaired if damaged.

[0004] Commonly used pigments in these products are composed of small particles of inorganic compounds, often metallic oxides, which are roughly spherical in shape. Other pigments are also sometimes used, as well as fillers and larger pieces of colored material or "particulates" to provide different visual effects. Aluminum trihydrate (ATH) is often included as a preferred filler to provide translucency and whiteness to the products, as well as for its excellent fire-retardant properties.

[0005] Pearlescent buttons have been made for many years by injection molding or the like, using pearlescent and iridescent pigments. Such pigments have been used in other fields as well, such as in the manufacture of bowling balls. Commercially available pigments of this type, referred to by various names such as opalescent, pearlescent, iridescent, and interference pigments, are used to give various products a sheen, reflectivity, and three dimensional look. While these pigments have found use in solid surface materials, there have been several associated problems. Many such "pearlescent" pigments become buried in the body of the products away from the surface so that their light reflecting properties are lost. In addition, commonly available pearlescent pigments are shear sensitive, and their pearlescent effect is greatly reduced by the addition of common opacifiers or fillers used in these products, such as titanium dioxide and ATH.

[0006] More recently, solid surface products have appeared which have utilized anisotropic particles such as natural and synthetic mica. For example, Alfonso et al. in U.S. Patent Nos. 6,040,045 and 7,081,220 teach a solid surface material using filled polymer resins. The products also include translucent fire retardant (TFR) particles containing mica flakes having metal oxide coatings which enhance the pearlescent visual effects of the product. The mica flakes are taught to be oriented in the

resin by casting a mixture of mica flakes, resin, and filler onto a flat plate or belt and then heating the cast material differentially from the bottom to cause the mica flakes to become oriented. The cured material is then ground into different TFR particle sizes and added to conventional solid surface products. The patentee teaches that the use of mica flakes directly in the final solid surface product does not yield the proper orientation or desired

[0007] Miller et al., U.S. Patent No. 6,515,060, is also directed to a solid surface product that contains from about 0.1 to about 30 wt% synthetic mica in a filled acrylic resin. The product is made by mixing a filler (such as ATH) with a resin syrup and the synthetic mica in a vacuum-equipped vat or mixer. The de-gassed liquid mixture is then poured into a mold, cast, and cured. However, such a method does not expose the final cast product surface area to vacuum de-gassing and allow the mica particles to effectively orient themselves.

[0008] While improvements have been made in the art, there still remains a need for solid surface products that can produce even more pronounced and striking pearlescent visual effects, and which can be made using fewer manufacturing steps.

[0009] The present invention addresses that need by providing solid surface products containing oriented particles which provide a unique pearlescent reflective appearance and methods of making those products. As used herein, the terms "pearlescent," "opalescent," "iridescent," "nacreous," and "interference" are used as synonyms for pigments that exhibit various colors depending on the angles of illumination and viewing, as observed, for example, in mother-of-pearl. As used herein, the term "anisotropic" is used to describe a particle that exhibits different visual properties when viewed at different angles and includes particles which have linear dimensions (length and/or width) that exceed their thickness. Such particles may take the form of flakes, platelets, leaves, and thin sheets.

[0010] In accordance with one aspect of the invention, a solid surface material is provided which exhibits a pearlescent visual appearance and comprises from about 25 to about 95 wt%, i.e. weight percent, of a polymer resin, from about 0 to about 70 wt% of a filler, and from about 0.1 to about 15 wt% of oriented anisotropic pigment particles dispersed substantially throughout the polymer resin to provide the pearlescent visual appearance.

[0011] While any of a number of different thermosetting polymer resins may be utilized, in a preferred form, the polymer resin is selected from the group consisting of polyester resins, polyacrylate resins, and mixtures thereof. Additionally, the fillers used in the material may also vary widely in composition. In a preferred form, the filler is selected from the group consisting of aluminum trihydrate, calcium carbonate, barium sulfate, magnesium hydroxide, talc, and mixtures thereof. Further, a number of different inorganic pigment particles, either natural or synthetic in origin, may be used. In a preferred form, the pigment particles comprise metal oxide coated mica par-

tides.

[0012] The solid surface material has upper and lower major surfaces. Because of the novel manner in which the material is formed, the upper surface exhibits a first pearlescent visual appearance in which the pigment particles produce a pattern with relatively smaller repeating units and the lower surface exhibits a second pearlescent visual appearance in which the pigment particles produce a pattern with relatively larger repeating units.

[0013] In accordance with another aspect of the present invention, a method for producing a solid surface material having a pearlescent visual appearance is provided and includes forming a mixture of from about 25 to about 95 wt% of a polymer resin, from about 0 to about 70 wt% of a filler, and from about 0.1 to about 15 wt% of anisotropic pigment particles and dispersing the pigment particles substantially throughout the mixture; casting the mixture into an open mold; applying a vacuum to the molded mixture to release entrapped gases therein and causing the pigment particles to become oriented in the mixture; and curing the molded mixture to produce a solid surface material having a pearlescent visual appearance.

[0014] In a preferred form, the vacuum which is applied is less than about 3 pounds per square inch absolute pressure (psia) (2.07×10^4 Pa), or a vacuum greater than about 24 inches of mercury, for about 1 to 3 minutes. The pearlescent visual appearance of the material may be controlled by either varying the level of vacuum, varying the time in which the mixture is exposed to vacuum, varying the thixotropicity and/or viscosity of the mixture, or a combination of the above. Preferably, the mixture is first gelled at ambient temperature and then cured at a temperature of from about 80 to about 100°C for from about 1 to about 4 hours.

[0015] Accordingly, it is a feature of the present invention to provide solid surface products containing oriented particles which provide a unique pearlescent reflective appearance and to methods of making those products. It is another feature of the present invention to provide nonporous solid surface products with improved dimensional stability and resultant warpage characteristics compared to those of the prior art. It is a further feature of the present invention to provide solid surface products with substantially less air voids compared to those of the prior art. Still other features and advantages of the present invention will be apparent from the following detailed description, the accompanying drawings, and the appended claims.

[0016] The following detailed description of specific embodiments of the present invention can be best understood when read in conjunction with the following drawings, where like structure is indicated with like reference numerals and in which:

Fig. 1 is a schematic cut away side view of one embodiment of the mold used in the practice of the present invention;

Fig. 2 is a schematic top view of the mold of Fig. 1;

Fig. 3 is a schematic side view of one embodiment of the vacuum chamber used in the practice of the present invention;

Fig. 4 is a cutaway side view of one embodiment of the mold loaded into the vacuum chamber; and

Fig. 5 is an enlarged cross-sectional schematic representation of the orientation of particles in the molded resin caused by the out-gassing of dissolved gases and volatiles in the resin.

[0017] Polymer resins which are useful in the practice of embodiments of the present invention are not specifically limited as long as they can be formed into a solid surface material by curing. Preferred free radical, heat curable resins particularly useful in the practice of the present invention are thermosetting unsaturated polyester resins and thermosetting polyacrylate resins, and combinations thereof. The term resin or "syrup" commonly refers to the uncured liquid state of a polymer, where said polymer is present in solution with a suitable crosslinking monomer. Examples of useful unsaturated polyester resins are reaction products of unsaturated dicarboxylic acids, or unsaturated dicarboxylic acids and saturated dicarboxylic acids, with glycols, such as maleic acid, phthalic acid and dipropylene glycol monomers respectively. Commonly, styrene is employed as the monomeric crosslinker for the polyester resins. Examples of useful polyacrylate resins include various kinds of conventional acrylic group monomers, acrylic group partial polymers, vinyl monomers for copolymerization other than acrylic group monomers, or oligomers. As the acrylic group monomer, (meth)acrylic ester is preferable. The use of methyl methacrylate monomer is preferred as the acrylic resin crosslinker. Additional useful thermosettable polymers include epoxies, urethanes, acrylo-urethanes, melamines and combinations thereof. The total amount of fluid polymerizable constituent in the castable composition of the present invention is from about 25 to about 95 wt%, and preferably from about 25 to about 45 wt%.

[0018] Exemplary polymer resins are unsaturated polyester resins, which are the reaction products of glycols and unsaturated dicarboxylic acids, or the reaction products of glycols and unsaturated dicarboxylic acids and saturated dicarboxylic acids. The glycol can comprise one or more of ethylene glycol, diethylene glycol, propylene glycol, dipropylene glycol, neopentyl glycol, 1,3-propanediol, 1,2-butanediol or 1,4-butanediol. The unsaturated dicarboxylic acid can be one or more of maleic acid, fumaric acid, and their anhydrides. The saturated dicarboxylic acid can be one or more of phthalic acid, isophthalic acid, terephthalic acid, adipic acid, succinic acid, pimelic acid, suberic acid, azelaic acid, aebacic acid, and their anhydrides. The above monomers are not considered exhaustive, but are those typically used in the art.

Methods of preparing such polymers are well known by those versed in the art, and are also commercially available. The most common monomeric crosslinker, used in the resin syrup, is styrene, which is preferred in the practice of the present invention. The viscosity of the castable syrup composition is related to the molecular weight of the polymer, as well as its concentration in the monomer, which can be varied in such a way as to control the rheology of the syrup composition.

[0019] Another exemplary polymer resin is poly(methyl methacrylate). As a castable composition, it is typically introduced as a solution or syrup of the polymer preferably dissolved in methyl methacrylate monomer. As for the polyester resins previously described, methods of preparing such a polymer and syrup therefrom are well known and described in the prior art, and are both commercially available as well. The viscosity of the castable syrup composition is related to the molecular weight of the polymer, as well as its concentration in the monomer, which can be varied in such a way as to control the rheology of the syrup composition.

[0020] Other polymerizable polyacrylate monomers useful as fluid polymerizable constituents are alkyl acrylates and methacrylates in which the alkyl groups can vary from 1-18 carbon atoms, but preferably 1-4 carbon atoms. Suitable acrylic monomers are methyl acrylate; ethyl acrylate and methacrylate; n-propyl and i-propyl acrylates and methacrylates; n-butyl, 2-butyl, i-butyl and t-butyl acrylates and methacrylates; 2-ethylhexyl acrylate and methacrylate; cyclohexyl acrylate and methacrylate; omega-hydroxyalkyl acrylates and methacrylates; N,N-dialkylaminoalkyl acrylates and methacrylates; N-[t-butyl]aminoethyl acrylate and methacrylate; styrene; vinyl acetate; acrylonitrile, methacrylonitrile; acrylamide and methacrylamide; allyl acrylate and methacrylate; divinylbenzene and divinyltoluene. The above reactive monomers are not considered exhaustive, but are those typically used in the art.

[0021] Incorporation of orientable anisotropic particles into the polymer resin allows the creation of additional visual aesthetics, including pearlescent, opalescent, nacreous, and/or iridescent appearances. The anisotropic particles have different physical and visual properties when viewed from different directions. For example, the particles can have an appearance that varies depending on the angle of observation. The particles preferably have an aspect ratio of at least 3. It will be appreciated that the patterns in the decorative solid surface materials that are produced have a three dimensional appearance which is distinct from patterns obtained by applying decals, appliques and paint to a surface.

[0022] These particles have an aspect ratio such that the particles become oriented by the out-gassing of dissolved air and volatile compounds when processed as described in further detail below. As used herein, aspect ratio is the largest dimension of the particle (typically length) divided by the smallest dimension (typically thickness). The particles also have a different aesthetic effect

when aligned at various angles relative to the material surface and to the viewer. These effects may be due to angle dependent reflectivity, angle dependent color absorption/reflection, or visible shape.

[0023] Examples of suitable particles which produce the pearlescent visual appearance patterns include, but are not limited to minerals (such as, for example, mica, synthetic mica, alumina, silica, etc.), glasses, ceramics, or other natural or synthetic substrates coated with various materials (such as, for example, metal oxides, pigments, dyes, etc.) which provide variations in reflectivity, interference patterns or selective color absorption. Said particles constitute from about 0.1 to about 15 wt%, and preferably from about 0.9 to about 3.0 wt%.

[0024] While the solid surface material can be unfilled, it is preferred in some embodiments to include a filler. Suitable fillers include, for example, aluminum trihydrate, calcium carbonate, titanium dioxide, barium sulfate, magnesium hydroxide, and talc, which as examples, are not considered to be exhaustive and not intended to limit the scope of the claimed invention. Fillers can be present in amounts of from between about 0 to about 70 wt%. Preferably, fillers are added to the composition in amounts from about 50 to about 70 wt%.

[0025] It is also known to include in solid surface materials other additives such as pigments, dyes, flame retardant agents, release agents, fluidizing agents, viscosity control agents, curing agents, antioxidants, toughening agents, and the like as is well known to those of ordinary skill in the art. For example, additional pigments having differing or contrasting colors from the oriented anisotropic pigments particles may be added to the composition to produce a "family" of different colored solid surface products having the pearlescent visual appearance. The inclusion of minor amounts of any or all of these additives is contemplated.

[0026] In producing the solid surface material, the polymer resin, preferably in syrup form, is mixed optionally with a filler, the orientable anisotropic pigment particles, and any other conventional additives deemed beneficial. From about 25 to about 95 wt% of the polymer resin, from about 0 to about 70 wt% of the filler, and from about 0.1 to about 15 wt% of the orientable anisotropic pigment particles, and preferably from about 25 to about 45 wt% of the polymer resin, from about 50 to about 70 wt% of the filler, and from about 0.9 to about 3.0 wt% of the orientable anisotropic pigment particles, are mixed together, and the particles are dispersed substantially throughout the polymer resin. In a preferred embodiment of the present invention, a mixture from about 80 to about 90 wt% polyester resin syrup, and from about 10 to about 20 wt% polyacrylate resin syrup is employed as the polymer constituent of the blend, wherein the polyester resin tends to impart toughness and the acrylic resin tends to impart flexibility to the final cured product. Any suitable mixing method may be used, including a dispersing-type blade mixer, kneading mixer, screw mixer, or double planetary mixer. A suitable curing catalyst is also preferred.

ably added to the mixture, with the catalyst type and concentration being matched to the particular polymer or polymers, and processing conditions, being used.

[0027] The syrup mixture is dispensed from the mixing vessel and cast into a suitable open mold which is sized to provide a sheet of solid surface material having the desired length, width, and thickness dimensions. In a preferred embodiment as shown in Fig. 1, the base 12 of the mold 10 supports a smooth, flat surface 15 such as a large pane of glass or sheet of polished metal. Typical dimensions for the glass are up to 60 inches (152 cm) wide and up to 160 inches (406 cm) in length. The mold 10 includes side walls 14 and 16 and end walls 18 and 20. Preferably at least one moveable side wall 16 and at least one moveable end wall 18 are provided. This provides flexibility in the sizes of sheets of the solid surface material which can be cast. The side and end walls are of a height which is greater than a typical cast thickness for the solid surface material. The walls may be of metal or plastic and are designed to act as a dam for the liquid resin composition as it is cast into the mold. A suitable mold release agent may be applied to the base and walls of the mold to aid in the removal of the solid surface material once it has been cured.

[0028] As shown in Fig. 1, mold 10 can be equipped with means for moving the mold such as caster wheels 22 positioned on rails 24. The caster wheels 22 are attached to a frame 26 which includes a plurality of leveling bolts 28. The leveling bolts are used to maintain the mold in a level, horizontal orientation during casting and curing of the resin mixture.

[0029] As best shown in Fig. 2, side wall 16 and end wall 18 are moveable to adjust the length and width of the cast composition. For example, different length blocks 30 may be used to secure the moveable side and end walls into proper position. Alternatively, other mechanical devices such as clamps or bolts (not shown) may be used to adjust and then secure the moveable side and end wall as needed.

[0030] Fig. 3 depicts a suitable vacuum chamber 32 which can be used in the practice of the invention. While one form of a vacuum chamber is shown by example only, it will be apparent to those skilled in this art that other forms of vacuum chambers may be utilized. Chamber 32 is fabricated of a suitable material such as steel, including reinforcing ribs 34. The chamber may be equipped with a hinged door 38 which is gasketed to permit an air-tight seal to be made when the door is closed. The chamber 32 is connected to a source of vacuum such as a vacuum pump 40 through vacuum line 42. Chamber 32 is also be equipped with a vent valve 44 to control the level of vacuum in the chamber, and a vacuum gauge 46 to permit an operator to monitor and adjust the level of vacuum as needed. As shown, the chamber 32 may also be provided with a sight glass 48 which permits an operator to view the progress of the orientation of the anisotropic pigment particles in the molded resin composition mixture.

[0031] As best shown in Fig. 4, the mold 10, containing the cast polymer mixture 50, is placed into vacuum chamber 32 that is sized to be able to completely contain the mold. In the exemplary equipment shown in the drawings, the mold may be supported on wheeled casters on rails so that it can be conveniently rolled into and out of chamber 32. Once mold 10 has been loaded into chamber 32, a vacuum is applied using pump 40 through vacuum line 42. As pressure in the chamber is reduced, air and volatile materials (such as monomers) dissolved or entrapped in the liquid polymer resin syrup are "boiled" or stripped off of the cast material as depicted by the vertical arrows (drawn in phantom lines) in Fig. 4.

[0032] This boiling and out-gassing action creates turbulence within the cast liquid material and causes the dispersed anisotropic pigment particles to become oriented and aligned in the viscous liquid polymer. This turbulence and orientation is depicted schematically in Fig. 5, wherein the turbulence, as shown by the arrows, is caused by the flow of minute air and volatile material gas bubbles 52 towards the surface of liquid resin composition 50, and acts to alter the dispersion of the anisotropic particles from an essentially uniform initial state 54 to a non-uniformly distributed oriented state 56. Generally, the applied vacuum is less than about 3 psia pressure. Application of the vacuum for from about 1 to about 3 minutes will typically be sufficient to cause the anisotropic pigment particles to become substantially oriented. Also depicted in Fig. 5 is a sanding and polishing plane 58, where the final surface finishing operation further exposes and highlights the desired pearlescent pattern effect of the present invention.

[0033] The degree of orientation and the size of the visual pattern which is produced by the pigment particles may be controlled in a number of ways. For example, the level of vacuum which is applied may be varied. Alternatively, or in addition, the time that the cast material is exposed to the vacuum may also be varied. Characteristics of the liquid resin may also be manipulated to vary the size and visual effect. For example, the viscosity or thixotropicity of the resin may be varied to control the size of the visual pattern that is produced.

[0034] Another important benefit of degassing and deaerating the cast liquid resin in situ in the mold by means of a vacuum chamber, rather than vacuum deaeration of the bulk resin composition in its mixing vessel before dispensing the resin to the mold, as taught in the prior art, is that reaeration of the resin during the pouring process is avoided, and the actual deaeration process is considerably more efficient and effective, with at least about 50 times the surface area of the liquid resin exposed to the vacuum atmosphere, analogous to a thin film evaporation process. As a result, the final cast and cured solid surface product contains substantially fewer air bubble voids than sheets produced using prior art methods.

[0035] After sufficient time is allowed for the out-gassing to orient the anisotropic particles in the resin, the vacuum is released by stopping and isolating vacuum

pump 40 and opening vent valve 44, and the mold 10 is then removed from vacuum chamber 32 by opening door 38 and rolling the mold out of the chamber. The cast resin 50 is permitted to gel and harden at ambient temperature for a period of time, typically from about 30 minutes to about 3 hours. Once the resin has substantially completely solidified or set, the solid surface material sheet is demolded and placed in a "post-cure" oven (not shown) to complete the polymerization and curing process.

[0036] Post-curing is typically carried out at temperatures of from about 80 to about 100°C for a period of from about 1 to about 4 hours, depending on the size, thickness, and composition of the solid surface material. Preferably, heating of the post-cure oven is accomplished by re-circulation of hot air over the curing material. Cooling then takes place gradually, typically by reducing the temperature of that recirculating oven air at the rate of approximately 1°F (0.5°C) per minute. The cast and cured solid surface material sheet is preferably cooled down to at least 115°F (46°C) before removal from the oven. The controlled gradual cooling or annealing results in substantially less internal stresses in the final cured sheet, which significantly improves its dimensional stability and reduces the possibility of sheet warpage compared to prior art solid surface sheet products.

[0037] The resulting solid surface sheets are then sanded and polished and their edges trimmed. The sheet provides a pearlescent visual appearance on both surfaces thereof and can be used for a variety of decorative surfacing end uses. Typically, while Fig. 5 depicts sanding and polishing of the top surface of the solid surface sheet as positioned in the mold, it is the bottom surface of the sheet, which has been cast against the glass pane or polished steel sheet 15 in mold 10 (as shown in Fig. 1), exhibiting the relatively larger repeating pearlescent units, that is sanded and polished after demolding, flipping and oven curing, and preferably provides the primary decorative surface of the solid surface sheet of the present invention. Alternatively, the sheets can be ground into smaller particles and incorporated as additives and fillers in other cast solid surface sheets of alternative designs.

[0038] It is noted that terms like "preferably," "commonly," and "typically" are not utilized herein to limit the scope of the claimed invention or to imply that certain features are critical, essential, or even important to the structure or function of the claimed invention. Rather, these terms are merely intended to highlight alternative or additional features that may or may not be utilized in a particular embodiment of the present invention.

[0039] For the purposes of describing and defining the present invention it is noted that the term "substantially" is utilized herein to represent the inherent degree of uncertainty that may be attributed to any quantitative comparison, value, measurement, or other representation. The term "substantially" is also utilized herein to represent the degree by which a quantitative representation may vary from a stated reference without resulting in a

change in the basic function of the subject matter at issue.

[0040] Having described the invention in detail and by reference to specific embodiments thereof, it will be apparent that modifications and variations are possible without departing from the scope of the invention defined in the appended claims. More specifically, although some aspects of the present invention are identified herein as preferred or particularly advantageous, it is contemplated that the present invention is not necessarily limited to these preferred aspects of the invention.

Claims

1. A solid surface material having a pearlescent visual appearance comprising, from about 25 to about 95 wt% of a polymer resin, from about 0 to about 70 wt% of a filler, and from about 0.1 to about 15 wt% of oriented anisotropic pigment particles dispersed substantially throughout the polymer resin to provide said pearlescent visual appearance.
2. A solid surface material as claimed in claim 1, wherein said polymer resin comprises a blend of from about 80 to about 90 wt% polyester and from about 10 to about 20 wt% polyacrylate.
3. A solid surface material as claimed in claim 1 or claim 2, in which said filler is selected from the group consisting of aluminum trihydrate, calcium carbonate, barium sulfate, magnesium hydroxide, talc, and mixtures thereof.
4. A solid surface material as claimed in any preceding claim, in which said polymer resin comprises from about 25 to about 45 wt%, said filler comprise from about 50 to about 70 wt%, and said oriented pigment particles comprise from about 0.9 to about 3.0 wt% of said solid surface material.
5. A solid surface material as claimed in any preceding claim, in which said oriented pigment particles comprise metal oxide coated mica flakes.
6. A solid surface material as claimed in any preceding claim, having upper and lower major surfaces, and wherein the upper surface exhibits a first visual appearance in which said pigment particles produce a pattern with relatively smaller repeating units and the lower surface exhibits a second visual appearance in which said pigment particles produce a pattern with relatively larger repeating units.
7. A method for producing a solid surface material having a pearlescent visual appearance comprising, forming a mixture of from about 25 to about 95 wt% of a polymer resin, from about 0 to about 70 wt% of a filler, and from about 0.1 to about 15 wt% of ani-

sotropic pigment particles and dispersing said pigment particles substantially throughout said mixture, casting said mixture into an open mold, applying a vacuum to the molded mixture to release entrapped gases in said molded mixture, causing said pigment particles to become oriented in said mixture, and curing said molded mixture to produce a solid surface material having a pearlescent visual appearance.

8. A method as claimed in claim 7, wherein said polymer resin comprises a blend of from about 80 to about 90 wt% polyester and from about 10 to about 20 wt% polyacrylate.
9. A method as claimed in claim 7 or claim 8, in which said filler is selected from the group consisting of aluminum trihydrate, calcium carbonate, barium sulfate, magnesium hydroxide, talc, and mixtures thereof.
10. A method as claimed in any of claims 7 to 9, in which said polymer resin comprises from about 25 to about 45 wt%, said filler comprise from about 50 to about 70 wt%, and said oriented pigment particles comprise from about 0.9 to about 3.0 wt% of said solid surface material.
11. A method as claimed in any of claims 7 to 10, in which said oriented pigment particles comprise metal oxide coated mica flakes.
12. A method as claimed in any of claims 7 to 11, in which the amount of vacuum is varied to control the size of a visual pattern which is produced.
13. A method as claimed in any of claims 7 to 12, in which the amount of time to which the molded mixture is exposed to vacuum is varied to control the size of a visual pattern which is produced.
14. A method as claimed in any of claims 7 to 13, in which a thixotropic index of said mixture is varied to control the size of a visual pattern which is produced.
15. A method as claimed in any of claims 7 to 14, in which viscosity of said mixture is varied to control the size of a visual pattern which is produced.

50

55

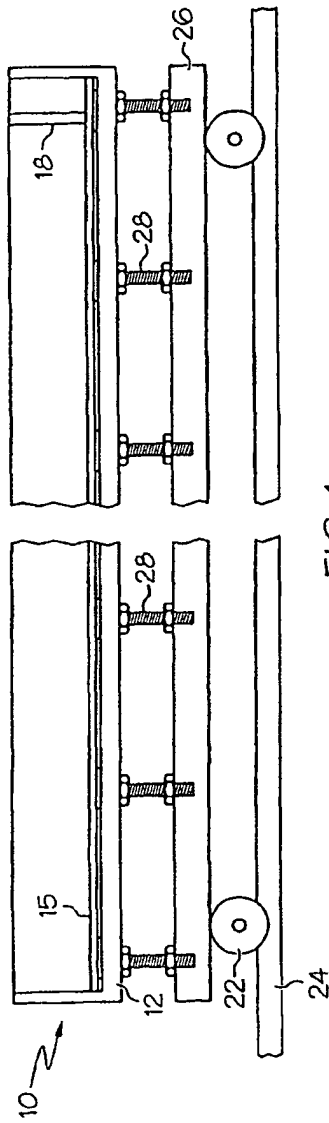


FIG. 1

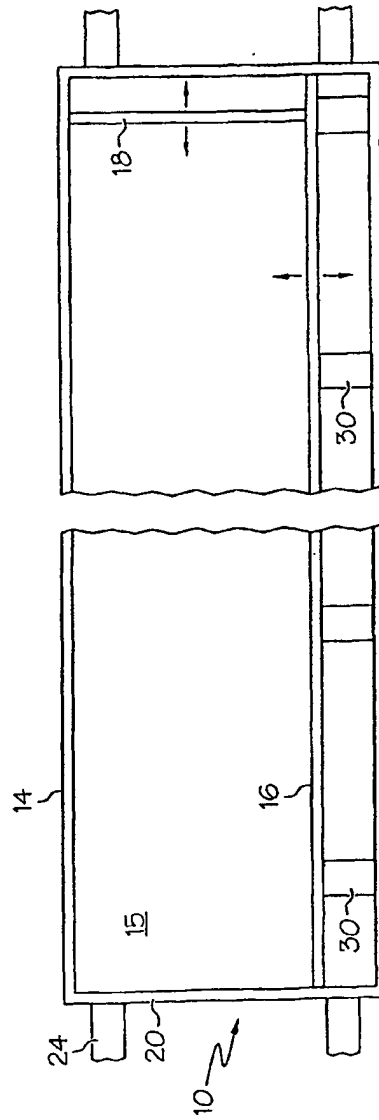


FIG. 2

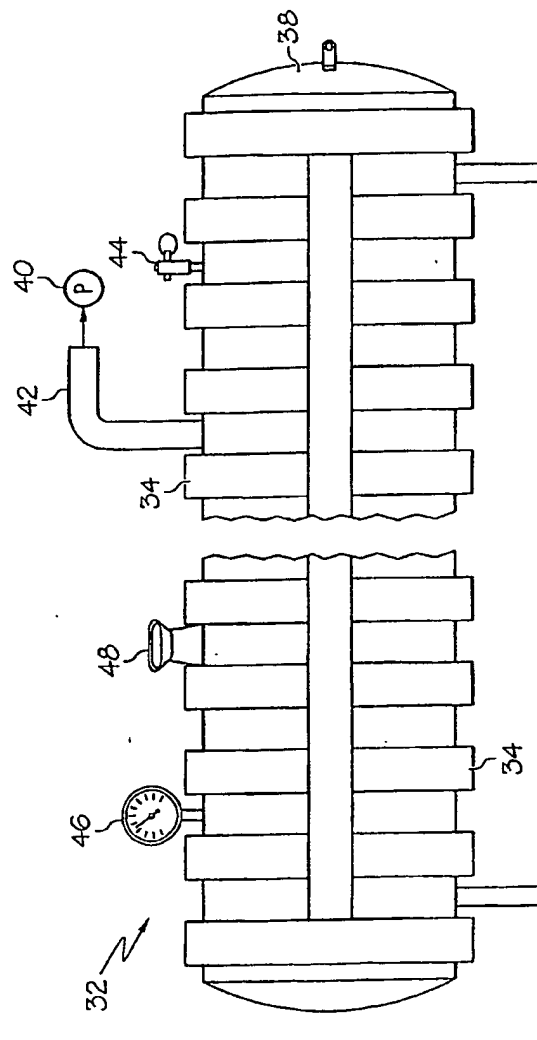


FIG. 3

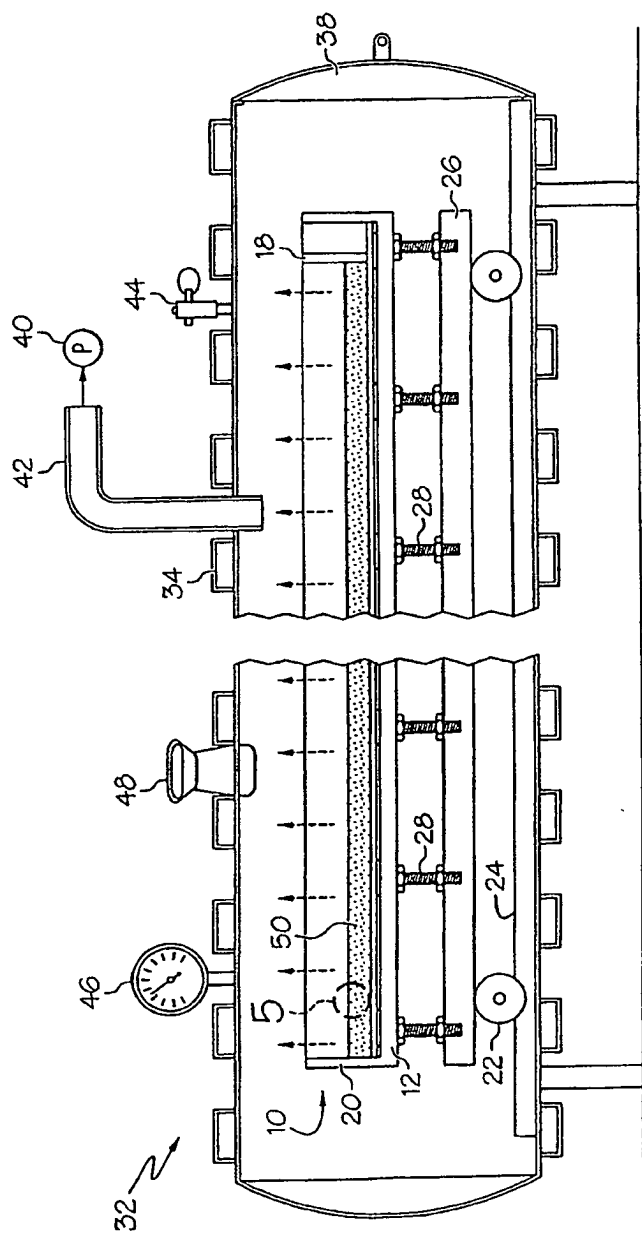


FIG. 4

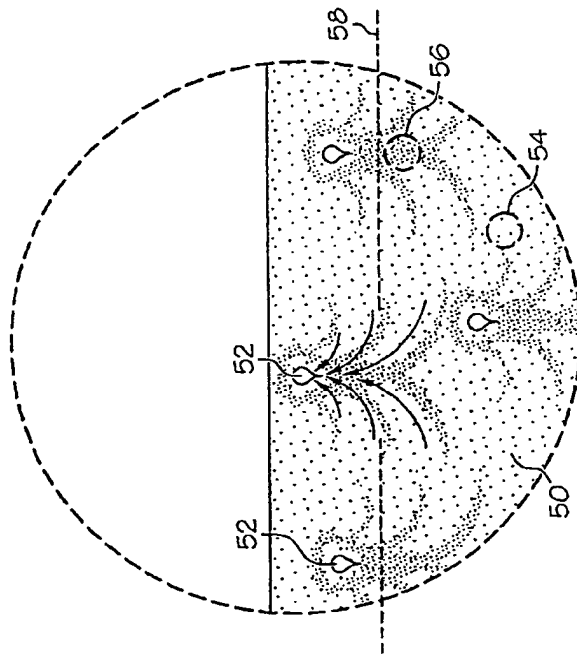


FIG. 5



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 08 25 1353

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 2006/056644 A (TIKKURILA CPS OY [FI]; FRERA LAURA [IT]) 1 June 2006 (2006-06-01) * claims 1-47; example 1 *	1-15	INV. C09D5/00
X	WO 2005/028573 A (BASF COATINGS AG [DE]; SCHNEIDER NORBERT [DE]; HILGER CHRISTOPHER [DE]) 31 March 2005 (2005-03-31) * claims 1-27; examples 1-3 *	1-15	
X	WO 03/046029 A (CIBA SC HOLDING AG [CH]; AUSCHRA CLEMENS [DE]; ECKSTEIN ERNST [DE]; ZI) 5 June 2003 (2003-06-05) * claims 1-20; examples 1-11 *	1-15	
X	DE 199 41 607 A1 (MERCK PATENT GMBH [DE]) 8 March 2001 (2001-03-08) * claims 1-7; examples 1-7 *	1-15	
D,X	US 6 040 045 A (ALFONSO JORGE [US] ET AL) 21 March 2000 (2000-03-21) * claims 1-17; examples 1-5 *	1-15	
D,X	US 2002/161094 A1 (MILLER RICHARD C [US] ET AL MILLER III RICHARD C [US] ET AL) 31 October 2002 (2002-10-31) * claims 1-8; examples 1-8 *	1-15	TECHNICAL FIELDS SEARCHED (IPC) C09D
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 22 July 2008	Examiner Glomm, Bernhard
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document</p>			

2
EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 08 25 1353

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

22-07-2008

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
WO 2006056644	A	01-06-2006	EP 1819783 A1	22-08-2007
WO 2005028573	A	31-03-2005	DE 10343393 A1	14-04-2005
			EP 1664212 A1	07-06-2006
			JP 2007505962 T	15-03-2007
			US 2007186814 A1	16-08-2007
WO 03046029	A	05-06-2003	AU 2002352086 A1	10-06-2003
			BR 0214616 A	14-09-2004
			CA 2465291 A1	05-06-2003
			CN 1639216 A	13-07-2005
			JP 2005510595 T	21-04-2005
			MX PA04004693 A	19-08-2004
			US 2006160950 A1	20-07-2006
			US 2005004317 A1	06-01-2005
DE 19941607	A1	08-03-2001	AT 264892 T	15-05-2004
			WO 0116235 A1	08-03-2001
			EP 1218455 A1	03-07-2002
			JP 2003508575 T	04-03-2003
			US 6743285 B1	01-06-2004
US 6040045	A	21-03-2000	US 7081220 B1	25-07-2006
US 2002161094	A1	31-10-2002	AU 2002254058 B2	08-06-2006
			BR 0207622 A	13-01-2004
			CA 2432951 A1	06-09-2002
			EP 1368417 A2	10-12-2003
			JP 4037758 B2	23-01-2008
			JP 2004524406 T	12-08-2004
			MX PA03007652 A	04-12-2003
			NZ 526889 A	25-02-2005
			WO 02068514 A2	06-09-2002

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 6040045 A, Alfonso [0006]
- US 7081220 B [0006]
- US 6515060 B, Miller [0007]